NewsRelease

National Aeronautics and
Space Administration

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For Release: May 1, 2002

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RELEASE NO. 02-033

NASA Helps Preserve Our Nation's History

A team of NASA scientists working at the request of the National Archives has determined why the United States' most important historical documents may be sealed in an atmosphere unhealthy to their future preservation.

Scientists from NASA's Langley Research Center in Hampton, Va., presented their final report in Gaithersburg, Md., at the National Institute of Standards and Technology, the organization contracted to provide encasements to the National Archives. They announced their findings on the composition of the atmosphere in the encasements of the Declaration of Independence, the U.S. Constitution and the Bill of Rights.

"The problem of deterioration has to do with the amount of water vapor or humidity in the encasements," said Joel Levine, the NASA Langley scientist who managed the project and gave the presentation. "There is nearly twice as much water vapor in the atmosphere around the documents as there should be. Too much water vapor in a closed system like an encasement can cause the glass to chemically decompose, which will lead to the deterioration of the documents."

Some humidity is necessary to keep the sheepskin documents from becoming brittle, but too much moisture could cause them to deteriorate.

In the early 1950s, the documents, collectively known as the Charters of Freedom, were sealed in specially prepared containers. The cases were filled with humidified helium to protect the documents. Many experts of document preservation suspected the helium had leaked and allowed air to enter the encasements, causing the documents to deteriorate. But the NASA Langley team proved that the cases remained safely sealed in the original atmosphere.

"We also discovered a very large amount of carbon dioxide in the encasements that is nearly ten times higher than what is found in Earth's atmosphere, and that is a very surprising result," said Levine.

Over the next few months, the National Archives will replace the containers preserving the Charters of Freedom. Before doing so, the agency wanted to understand why the documents were deteriorating and contacted Dr. Levine for assistance.

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His research group consisted of three independent teams that included NASA Langley researchers Patricia Davis, Jeffrey Jordan, Glen Sachse, Glenn Diskin, James West and Cecil Burkett. Two teams used non-invasive measurements techniques to study the atmosphere through the glass encasement. The third team used NASA Langley instruments to determine the chemical composition of extracted samples from each case. The teams, unaware of the others' findings and applying different methods, produced very consistent results.

"These documents form the basis of U.S. democracy, and it is important to preserve them," said Levine. "We're happy we were able to apply technology, originally developed at Langley for atmospheric science, remote sensing, laser spectroscopy and wind tunnel measurements, to ensure the future stability of the Charters of Freedom."

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